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## PSYCHOLOGICAL LITERATURE.

### I.—NERVOUS SYSTEM.

*Histogenese und Zusammenhang der Nervelemente.* W. His. Archiv für Anatomie und Physiologie. Anat. Abthl. Supplement-Band, 1890.

This paper contains the substance of an address made on August 7, 1890, before the Anatomical Section of the International Medical Congress at Berlin. His begins with the question of histogenesis. At the time of separation, the medullary plate consists of a single layer of epithelial cells forming when cut across a nucleated middle zone, and two non-nucleated zones, one above and one below the former. The part of the cell body above the nucleus soon forms a striated pillar or stem with an expanded base, and the bases fuse to form a limiting membrane. The part below is also striated, but soon breaks up into short branches on a more or less divided stem which form among themselves a meshwork. By the formation of the medullary tube, the part above comes to be the wall of the enclosed canal, while the part below becomes the more excentric portion of the surrounding substance. The former, which thus represents the wall of the ventricular cavities and the central canal is designated as the columnar layer (*Säulenschicht*), the latter, as the limiting mantle (*Randschleier*). It is the limiting mantle which grows extensively both by enlargement of existing elements and formation of new cells. The entire tissue thus formed is designated as the myelo- or neuro-spongium, and the individual cells as spongioblasts. In the adult it is the innermost layer of spongioblasts which form the ventricular epithelium. His has always held the view that the branches formed a net-work in the limiting mantle. The investigations of Ramon y Cajal lead to the view that the branches of the cells are not morphologically continuous, though they may be closely apposed.

Almost from the first there are to be found among these epithelial elements another group of cells, the germinal cells (*Keimzellen*). These cells lie mainly in the columnar layer of the neurospongium, are variable in number according to the age of the embryo and the location in the nervous axis, undergo rapid division, and are amoeboid in their early stages. In human embryos the last germinal cells are visible at the end of the second month. The protoplasm becomes accumulated at one side of the nucleus in a conical striated mass, and in this form they are designated neuroblasts, the conical prolongation being the beginning of the axis-cylinder prolongation. The tendency to wander leads to the early formation of a layer of neuroblasts in the limiting mantle, where they constitute the so-called mantle layer (*Mantelschicht*). While the cells themselves remain for the most part within the limiting mantle, sending their axis-cylinder prolongations beyond it in various directions, it sometimes happens that the cell body passes more or less beyond the limits of the neurospongium. For the most part these exceptional cells are overtaken in turn by the limiting mantle and finally buried in it, but there seem to be cases where this does not occur. This wandering tendency is strongly developed in parts of the *medulla oblongata*, and the olivary bodies are formed from cells which have travelled a long course. The medullary plate is thus composed at the start of epithe-

lial and germinal cells. At the time of first multiplication of the neuroblasts, blood vessels enter the medullary plate from without, but no other elements appear. About the end of the second month in the human embryo, there appear amœboid connective tissue cells with dark nuclei. They are first seen on the outside of the neurospongium, but gradually become scattered through it. These form one constituent of the neuroglia. The neuroglia then of the adult is of mixed origin, being the neurospongium plus the connective tissue cells just mentioned. Deiter's cells he therefore considers as genuine connective tissue cells.

The neuroblasts of the medullary plate develop nerve fibres which either pass out as centrifugal fibres or remain as intra-medullary. The sensory roots come from the spinal ganglia. Here the cells are at first bipolar, but gradually change to the form where they give rise to a T-process. Passing by the description of the origin of the cells of the spinal ganglia, we come to the discussion of the origin of the sympathetic ganglia. The arrangement here is remarkable. That the sympathetic ganglia are not simply constricted off from the spinal ganglia is indicated by the following facts: The spinal ganglion cells are fully formed before the sympathetic ganglia appear, and the cells of the latter are unlike those of the former. The *rami communicantes* are formed before the sympathetic ganglia. It appears that the *rami* lead the way, and that undeveloped germinal cells, which appear in the spinal ganglia, then follow to the point of the future sympathetic ganglion. From the chain of the lateral ganglia the other orders of ganglia are developed in a similar manner.

The sensory nerves belonging to the organs of special sense appear to develop after the manner of the spinal sensory nerves, save in the case of the optic. Here he recognizes that the optic nerve may contain fibres that develop and conduct in reverse directions, as demonstrated by Ramon y Cajal. In all sense-organs the distinction between the spongioblasts and the functional germinal cells reappears.

Passing to the second part of the paper, the connection between the nervous elements, the conclusions may be more briefly stated. Within the central nervous system each cell gives out only one axis-cylinder process. The cells of the spinal ganglion give out two. The arrangement in the sympathetic nerve-cells must be left open until the fate of the spiral process can be determined. The axis-cylinder prolongation is first to appear in the nerve-cells and for a long time is the only prolongation they have. As at a very early period embryos have a nervous system without nerves, so there is a period when the nervous system consists only of cells and single long fibres running from them and when the felt-work of fibres due to protoplasmic prolongations and branches of the axis-cylinders is wanting; yet this kind of a nervous system is capable of complicated physiological activity, as can be seen in young larvæ of frogs and fish. Only at a later period are the protoplasmic prolongations developed. In man this occurs in the embryo about the end of the second month. In the cerebral hemispheres their development is subsequent to that in the spinal cord. As there is no evidence for continuity between any of the prolongations of any two nerves or nerves and cells, but in the central system all prolongations are closely matted together in a diffuse intermediate substance, it must be this latter which in some way establishes the final connection between the various elements. On the growth of the axis-cylinder His makes the point that a long time may elapse before it reaches its destination, but having reached it, it ceases to grow. The power to grow is not lost, since on cutting the end from the fibre it grows again. Why it normally stops growing then, has yet to be explained. Concerning the cells of Golgi's second type, the central cells, they appear to be of later origin in the nervous system than the others, and it is suggested

that perhaps the resistance to development with which they meet in the more completely formed tissues may account for the diffuse character of their axis-cylinder prolongations. One interesting deduction from the laws of growth can be applied to the completed nervous system. Since the nerve-cells and fibres start from fixed points, those that appear first in development will be more or less overgrown and covered by those which appear later. This is illustrated by the relations of the nuclei of the *hypoglossus*, lateral column, the ascending root of the *glossopharyngeus* and *vagus*, etc., in a cross-section of the *medulla*. No one can read this paper of His without assenting to his final statement that embryology stands foremost among the means which we have at our command for unraveling the organization of the central nervous system.

*Zur feineren Anatomie des centralen Nerven-systems. Erster Beitrag. Das Kleinhirn.* A. KÖLLIKER. Zeitschrift f. Wissen. Zool., B. 49, H. 1. Mai, 1890. Taf. XXX—XXXIII.

Under this title Kölliker has reviewed the results obtained by Golgi, Ramon y Cajal, and himself, laying of course the principal emphasis on the method of silver impregnation introduced by Golgi. The lower mammals, cat, dog, etc., are largely used in these studies, and it is not always clear how far the several points have been made out for man, but I will endeavor to give a description of the elements in the human cerebellar cortex as they are now regarded by Kölliker.

*The Molecular Layer:* The cells of Purkinje are somewhat flattened and their enormously developed protoplasmic prolongations lie in a plane at right angles to the long axis of the cerebellar folia. These prolongations end free. The axis-cylinder prolongation gives off lateral branches, some of which at least turn back towards the molecular layer, while the main stem passes on to become a medullated fibre. The small cells of the Molecular Layer: (a) The peripheral small cells lie in the outer half of the molecular layer and have well-developed protoplasmic prolongations. The axis-cylinder prolongation is present, but its character and distribution have not been determined. (b) The central small cells belong to the most remarkable elements yet described for the nervous system, and from the peculiar terminations of the axis-cylinder prolongations have been termed "basket-cells." They lie just ectad of the bodies of Purkinje's cells, are more numerous where these latter are more abundant, have their long axis in the plane of the cortical surface, and give rise to numerous and complicated protoplasmic prolongations, some of which may run almost to the surface of the cortex. The axis-cylinder prolongation is very long, runs in the plane of the surface, just above the bodies of the cells of Purkinje and in the neighborhood of each cell sends down a branch, which dividing into a bunch of terminals forms a net or "basket" about the cells. Of this very remarkable arrangement Kölliker expresses himself as perfectly satisfied.

This exhausts the classes of nerve-cells in the molecular layer, and we pass next to the *Granular Layer*. There are here distinguished large and small nerve-cells. (a) Large nerve-cells: These are characterized by being few in number, situated just below the molecular layer, having their protoplasmic prolongations distributed in both molecular and granular layers, and having the axis-cylinder prolongations of the second type, which have thus far been found, distributed in the granular layer alone. (b) Far more numerous than the foregoing are the small nerve-cells of this layer. These are furnished with short protoplasmic processes which end in bunches of terminals, suggesting in a distant way the terminations of the axis-cylinder branches in the "basket cells." The axis-cylinder prolongations on the other hand are slender,